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ABSTRACT

This source book, designed for 11- to 14-year-old students, seeks to describe what life is like in Antarctica. In spite of extreme weather conditions, people go to Antarctica to work every summer. Some of them stay there during the winter as well. This book seeks to supply answers to such questions as: How do people get to Antarctica? Why do they go there? What do they do in Antarctica? How do they protect themselves against the severe cold? What do they do in their spare time? A glossary of terms is included. (DB)

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Living and working in ANTARCTICA

N R Kemp

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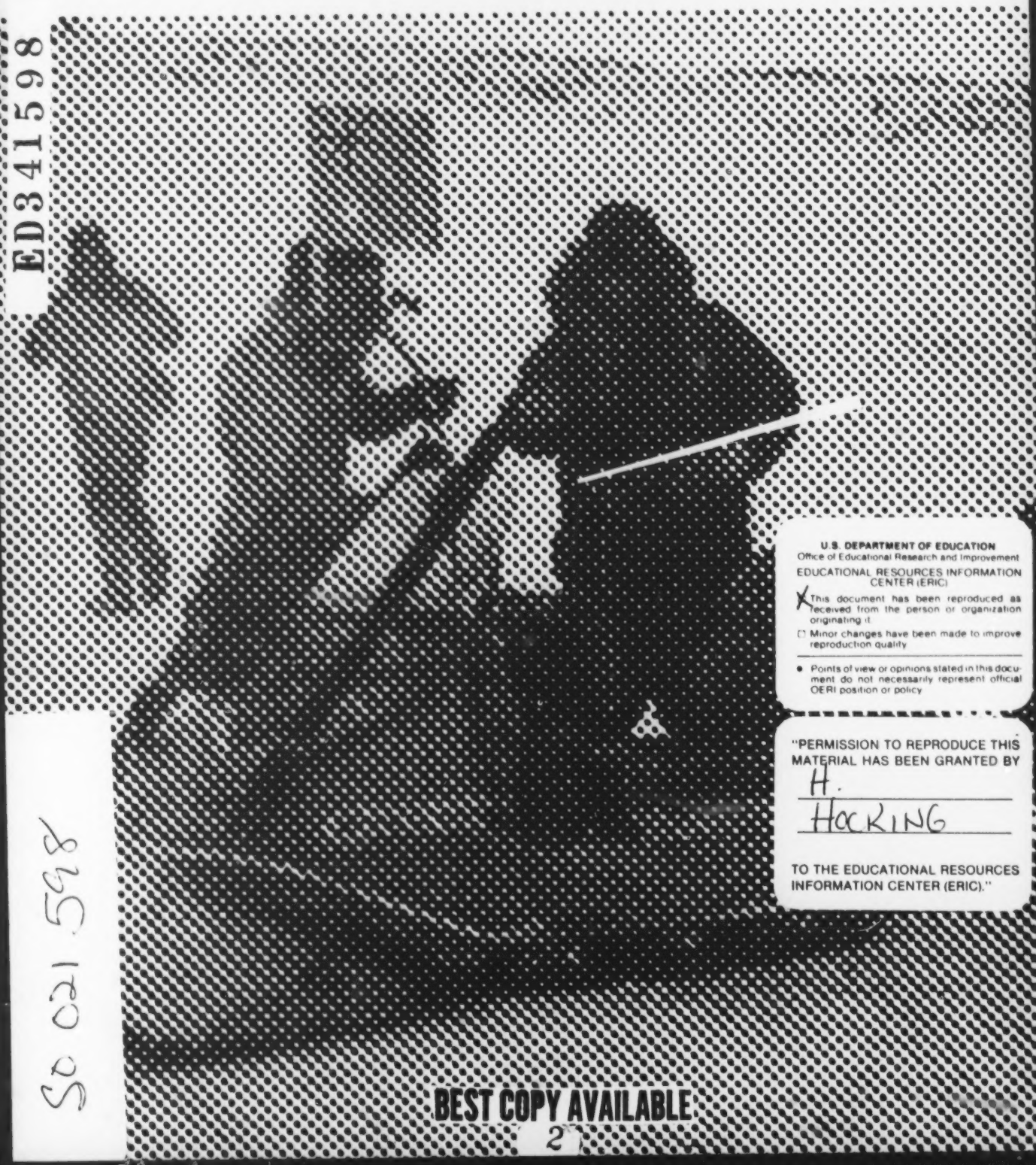

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Living and working in ANTARCTICA

Noel Kemp

Curriculum
Development
Centre
Canberra
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The Author

Noel Kemp is the Curator of Geology at the Tasmanian Museum. He holds diplomas in agriculture and education and a B.Sc. and M.Sc. from the University of Melbourne.

Before taking up his present position, Noel worked as a teacher in England and Australia and as a demonstrator in Geology at the University of Melbourne.

He spent two summers in Antarctica, the first studying vertebrates in the remote Cumulus Hills (1977-78) and again in northern Victoria Land (1981-82) where he worked on sedimentology and stratigraphy.

As well as all these activities, Noel also found time to drive overland from Australia to Ireland via India and to work as a part-time mechanic.

He has published numerous scientific papers, including many on the geology of Antarctica.

Acknowledgements

The publishers are grateful to Dr John Boyd of the Department of Science and Technology, Canberra for his valuable comments on and contributions to this and other titles in the Antarctic Project series. "National Geographic" kindly gave us permission to quote from David Lewis' article "Icebound in Antarctica". Our thanks also go to David Luders for comments printed on pages 30 and 45. All other diary extracts are from the diaries of the author. The geodesic dome model activity on page 46 is adapted from the Study of the Polar Regions project of the Los Angeles Unified School District, Los Angeles, California. Credits for all other photographs and diagrams appear in the text; to the individuals and organisations involved we extend our sincere thanks.

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Why study Antarctica?

One of the aims of the Pacific Circle Consortium is the development of educational materials with an international perspective, particularly materials that take into account the half of the earth's surface covered by the Pacific Ocean. To the south of the Pacific lie the Southern Ocean and the great Antarctic continent.

There are many reasons for studying Antarctica. It is a key element in the world's climate. Some of the secrets of the earth's past are locked beneath its icecap. It has a fascinating physical environment and a unique and fragile ecosystem. It is a frontier of scientific research and technological development.

Antarctica is unique and its history is an important and dramatic story of discovery and exploration. This story is sometimes inspiring, sometimes tragic, but it has much to teach us about how people react under extreme conditions and how they can live with each other and their environment.

The Pacific Circle Consortium believes that educational materials are most valuable when developed jointly, reflecting interests, issues and concerns that extend beyond national boundaries. For New Zealand and Australia, Antarctica is the Near South. Both New Zealand and Australia, along with other Pacific Circle members, Japan and the United States, are original signatories to the Antarctic Treaty. In that treaty, the nations recognised that it was in the interest of all the human race that Antarctica should forever be used only for peaceful purposes, and that freedom and international co-operation in scientific work in Antarctica would contribute to science and the progress of humanity.

The conservation and protection of the relatively pristine Antarctic environment is vital to our two nations. The wise international use and management of Antarctic resources will present many challenges that we, with the rest of the world community, will have to face and overcome. We trust that students and teachers will gain greater understanding, as well as enjoyment, as a result of studying this material.

For our own sakes and for the sake of the future of the whole world, the children of the Pacific must understand Antarctica, its problems and its importance.

Warren Brewer
Curriculum Development and
Education Branch
Education Department, Tasmania

Peter Brice
New Zealand Department of Education
Chairman, Pacific Circle Consortium

Kerry Kennedy
Curriculum Development Centre
Commonwealth Schools Commission,
Canberra.

(Australia Post)

Rafted ice floes among icebergs (B. Sorensen)

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Introduction

Have you ever given any thought to what it is like in Antarctica? In winter the whole continent is under a thick layer of ice and snow. Even in summer there are only a few outcrops of rock on the coast. It is colder than the freezer inside a refrigerator. Antarctica has the "worst" weather in the world. It is not only the coldest, but also the windiest continent.

Even though weather conditions are extreme, people go to Antarctica to work every summer. Some of them stay there during the winter as well.

How do people get to Antarctica? Why do they go there? What do they do in Antarctica? How do they dress to protect themselves against the severe cold? What do they do in their spare time?

Read on and you will find the answers to these questions.

A much-weathered iceberg, showing former water lines. Broken sea ice in the foreground. (Rayner Collection, National Library of Australia)

Loose snow can obscure everything during a very strong blizzard. (Antarctic Division, Australia — photo M. Corry)

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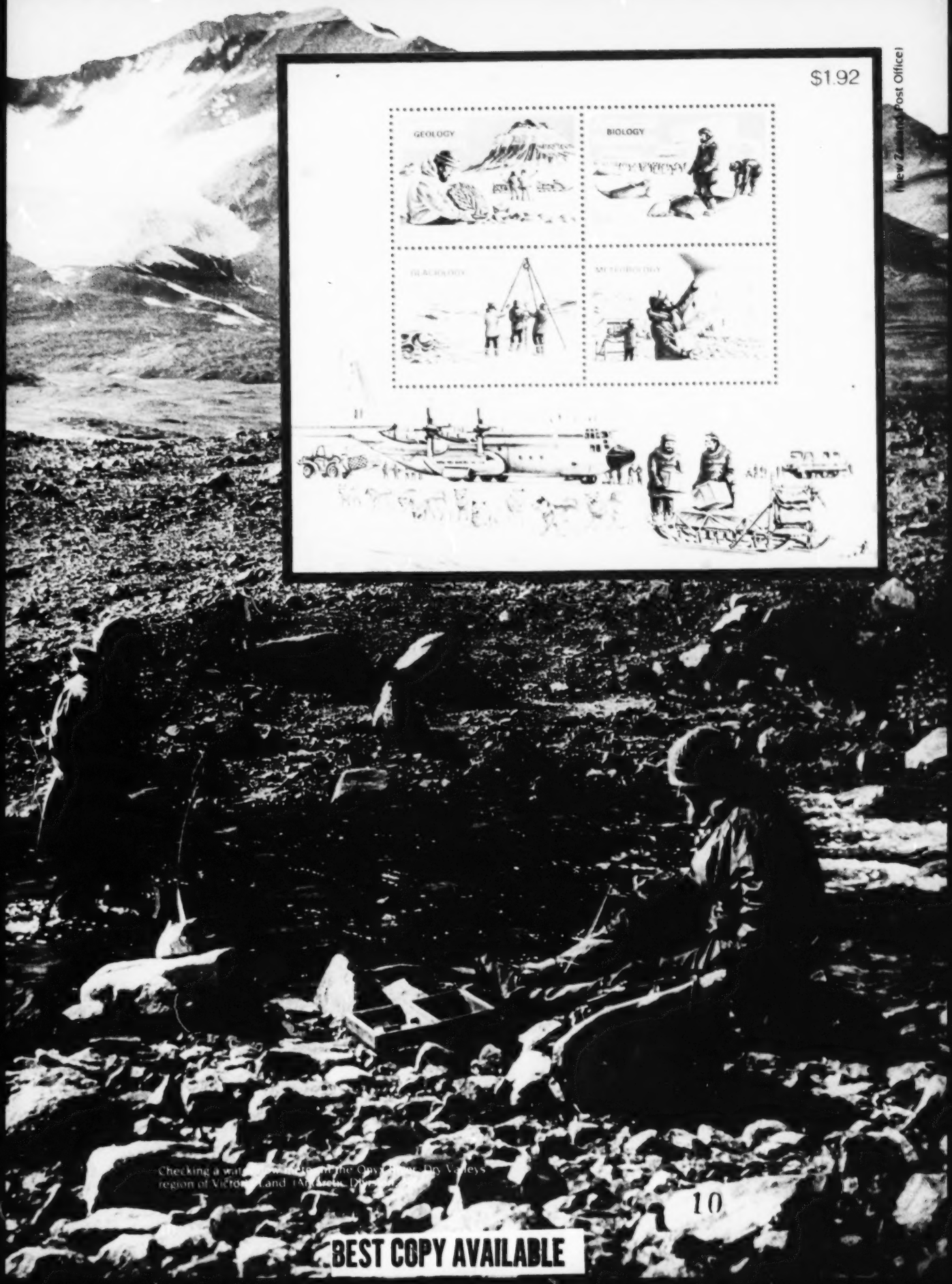

Checking a wat[illegible] in the Dry Valleys region of Victoria Land [illegible]

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What sort of people travel to Antarctica?

If you were to travel to one of the Antarctic stations you would find that the people there go for different reasons and stay for different lengths of time.

There are wintering groups which stay about twelve months, summer groups which are there for two or three months and change-over groups which are there only for a few days. When the expedition members are travelling by ship, some may be marine biologists whose work is done during the voyage.

Among the people at the stations, you will find research scientists, technicians operating and maintaining scientific equipment, and support staff such as cooks, medical officers, carpenters, mechanics and electricians. Of course there are also people responsible for transport — sailors, aircrew, operators of amphibious craft, tractor drivers and sometimes dog-handlers. It is a big job to transport all these people, their goods and equipment to Antarctica.

Many different kinds of scientist work in Antarctica. Those most often found (and what they study) include:

geophysicists (earth science)
glaciologists (ice and snow)
meteorologists (weather)
marine biologists (life in the water)
zoologists (animals)
botanists (plants)
geologists (rocks)
physicists (geomagnetism, upper atmosphere, cosmic rays).

Among these disciplines, there are many smaller areas of study. For example, the earth scientists who study the continent's geological history include people who work on sedimentary rocks, palaeontology (fossils), mineralogy, igneous rocks, structural geology and seismology (earthquakes). The physicists include people whose special areas of study may be cosmic rays, aurorae, geomagnetism, the ionosphere, solar physics and meteorites.

The rare rocky outcrops become important points for surveyors and scientists. (Australian Information Service)

Looking at the view

Finally I headed off up the slope. Took me two hours to get within about fifty metres of the top of the ridge, which is covered in blue ice. Did not attempt to go further without crampons, rope and ice-axe. I was still on the rock, much safer, although there were still many patches of snow and ice on the outcrops of rock. Mostly it was ice as it's pretty high up there — the top of the peak is just under 3000 metres.

The view was breathtaking, an uninterrupted panorama. It's not often that you get a 360 degree view without a building, a tree, a nearby hill or mountain blocking part of the horizon. It was darned cold up there though. I had no thermometer with me but by the crackling feeling in my lungs on the last half-hour's climbing, I'd reckon it was around -20°C. Only a light breeze, thank goodness.

A geologist pauses high on the windswept rocks at the edge of the Polar Plateau, southern Victoria Land. Skelton Neve (snowfield) in the background feeds Ferrar Glacier, which empties into McMurdo Sound near Ross Island. (N. Kemp)

Good view from Mt Misery and Dismal Buttress at the head "waters" (head ice sounds funny) of the mighty Shackleton Glacier where it commences its 140 kilometre course down to the Ross Ice Shelf. Just about due south I could see the huge shattered ice fall at the head of the Logie Glacier. On the map, the Logie is only a small glacier but from up there it looked really impressive — all that huge jumble of blue ice. Some of the blocks must be house-size or bigger.

Out past the Logie I could see the Polar Plateau. What an imposing sight that is. Poor Scott and his companions, it must have been really daunting. It's white and flat as far as the eye can see. It must be the most featureless expanse of nothingness on earth.

To the north I could see over the top of Shenk Peak, where we were finding the fossils the other day. The horizontal strata were easy to pick out, ending abruptly up near the top. The peak is capped with dolerite, like everything around here — and in Tasmania. Past Shenk Peak, the junction of the Shackleton and McGregor shows as a heavily crevassed area of blue ice. This slowly turns into large, longitudinal waves — it must be hundreds of metres from crest to crest. You probably would not notice them if you were down there travelling on a ski-doo. They're too big to make out up close.

I was beginning to shiver as the sweat in my clothes evaporated and took the heat from my body. I had eaten my "emergency" supply of chocolate bars (I had felt really hungry on the way up) so I started climbing down.

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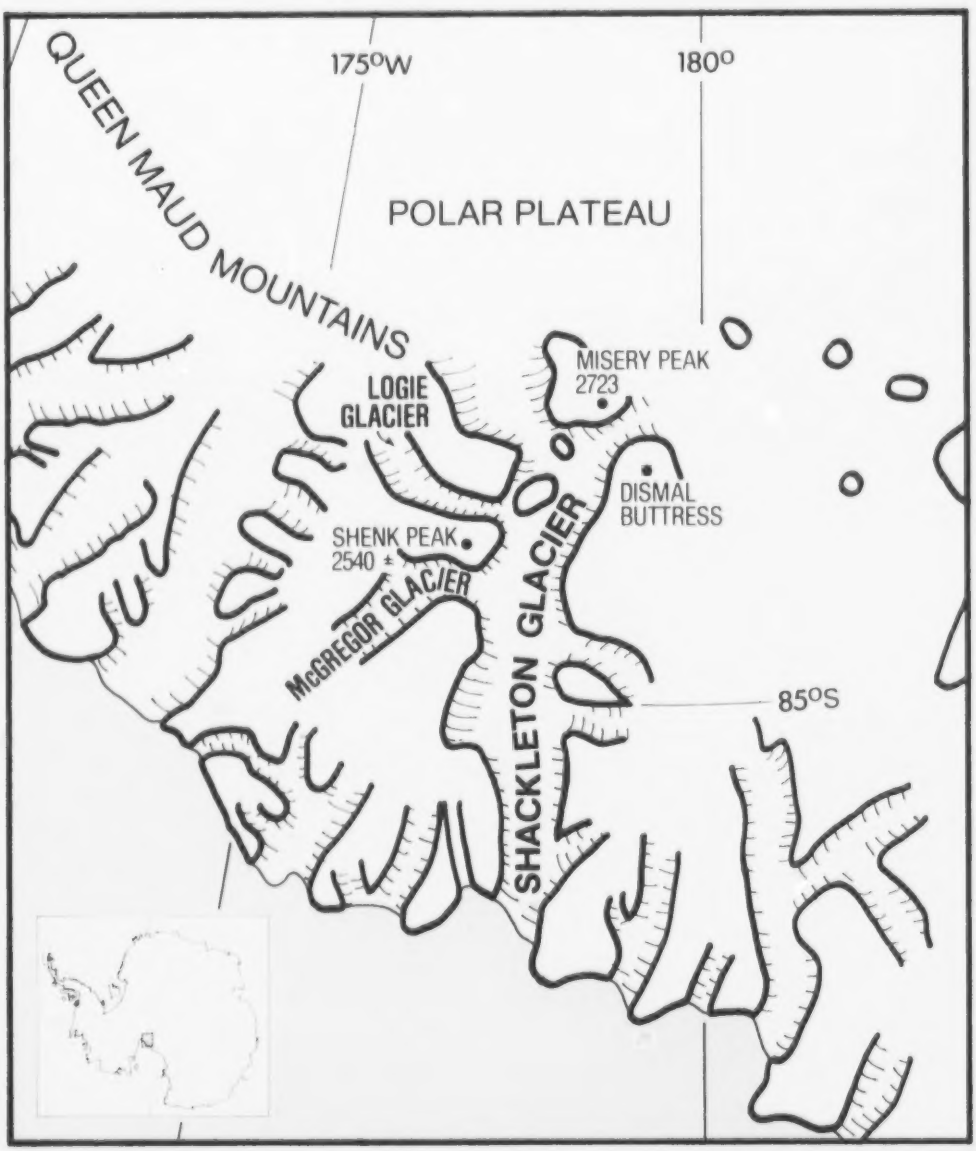
By sliding on my bottom on a few of the steep snow slopes, I reached the others in just under an hour. Must have been a fair bit of friction there as things were getting hot — literally — on the longer slopes, and that was with the snow temperature way below zero! I doubt if the seat of my pants would last the season if I travelled that way all the time. Certainly made for a quicker trip though. Bill, Cos and Wick had headed down earlier and now the four of us started down. It was after six o'clock by this stage.

From way up high I had seen two ski-doos — two such wee dots — moving along the valley. I blinked, looked away and then back again. Gone. Could not find them no matter how hard I looked. Just too far away. At 7.15 we stopped for a ten or fifteen minute rest. We were all pretty tired. Finally got to the ski-doos, which started right away.

Back at the hut by 8 o'clock. Filled up the tanks and staggered inside to find tea ready. The others had done well. And they even washed and wiped as well as getting tea. There's hope for mankind yet! The two teams compared notes of where we had been and what we had found. We wrapped up the specimens we'd collected and shades were up (that is the windows were blocked with cardboard to keep out the sun) by 10.30pm.



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The unusual and sometimes unique natural phenomena in Antarctica attract a variety of scientists. Many areas have still not been studied in detail and geographers and surveyors still have much to do on the continent.

The base stations are staffed by an officer-in-charge, a deputy and, depending on the size of the station, other administrative staff. There is a constant need for electrical fitters, diesel mechanics, carpenters, welders, cooks, communications officers and other support staff. Some stations, such as Mawson (Australia) and Scott Base (New Zealand) have dog-handlers as well.

During the summer there may be pilots and crew members for helicopters and fixed-wing aircraft. At the smaller stations some expedition members have to do several jobs. When the chef has a rest day, someone else has to do that, too.

Helicopters can move people and vital materials when ice prevents ships coming close inshore. (Antarctic Division, Australia — photo K. Gooley)

Casey Station was specially designed so that snow is blown both under and over the buildings. Casey lies on the low, rocky coast of Wilkes Land, 3800km due south of Perth. (L. Goldsworthy, Fund for Animals)

At larger stations like the United States station at McMurdo Sound there may be a summer population of up to 900. The post office alone has a staff of about a dozen people.

When scientists go out in the field, they are generally accompanied by technicians and field assistants. With large field parties travelling in tractor trains — large bulldozers or tractors each hauling sledges that have living quarters, equipment, fuel and workshop facilities — there is usually at least one diesel mechanic and a radio operator in each party. These trains can carry ten people and may travel for as long as four months, covering thousands of kilometres. Groups using motorised toboggans have at least one member who is a qualified mechanic. Smaller parties in mountainous areas include an assistant with mountaineering skills.

Swedish-built snow tractors. These tracked vehicles allow rescuers to reach any party which gets into difficulties far from base. (L. Goldsworthy, Fund for Animals)

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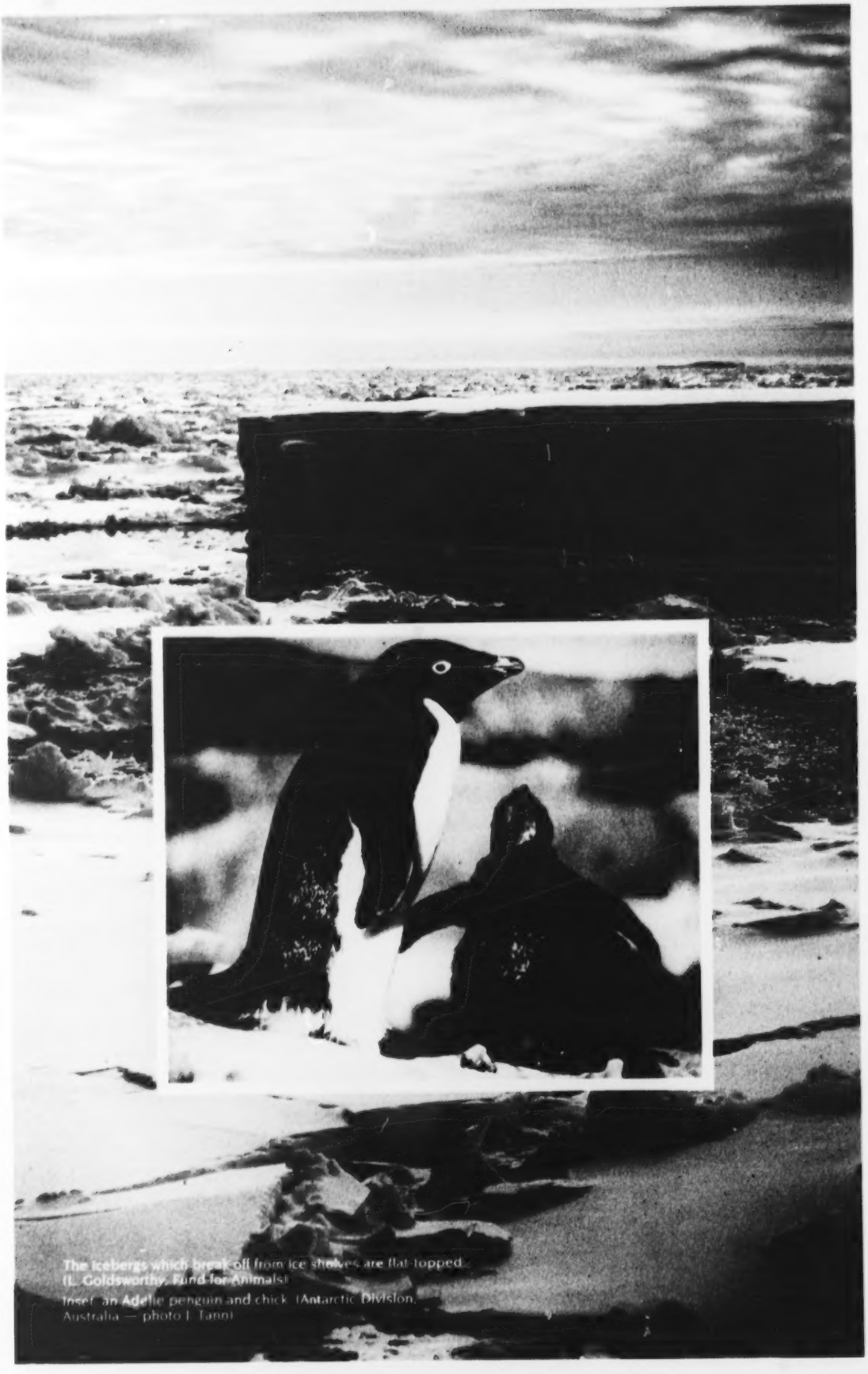
New building at Casey. Replaceable panels will be bolted onto the steel frames. In the foreground is a meltwater lake (I. Goldsworthy, Fund for Animals)

Activities

1. How long do wintering groups, summer groups and changeover groups stay in Antarctica?
2. Unscramble the occupations table below, by placing each person in the appropriate column. Cross out any occupations you think would be inappropriate in Antarctica.
   See if you can add another eight occupations to the table.
3. Read the section "Looking at the View". What are some of the pleasurable experiences which might draw people to work in Antarctica?
   Identify on the map on p.13 all the geographical features mentioned in the passage. What do you think was the position of the writer when describing the view?
4. Why don't the people who work in Antarctica take their families with them?
5. Make a list of the special buildings and work areas you would expect to find at an Antarctic station.

Scientific Research	Transport & Communication	Support for Personnel	Maintenance of Equipment
welder	cook	geologist	telephone sanitiser
tractor driver	botanist	diesel mechanic	dog-handler
meteorologist	carpenter	helicopter pilot	surveyor
storekeeper	electrician	seismologist	TV mechanic
accountant	two-stroke mechanic	mountaineer	



The icebergs which break off from ice shelves are flat-topped. (L. Goldsworthy, Fund for Animals)

Inset: an Adelie penguin and chick. (Antarctic Division, Australia — photo I. Tann)

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Preparation for working in Antarctica

Before participants leave for Antarctica, they attend at least a week's orientation programme. This is very important as it allows them to get to know everyone and gives them valuable information on the following topics:

the national and international significance of Antarctic research;

the Antarctic environment and the importance of environmental protection and conservation;

previous exploration and research and the way this fits in with the current programme;

the operation of the stations and the ships and aircraft used for travel to, from and on the continent.

People with experience in Antarctica illustrate their talk with slides and films and answer questions.

Sometimes training courses are also held. These vary from three days to a week or more and are sometimes held before departure, sometimes after arrival in Antarctica. They cover all aspects of survival in Antarctica. The topics include:

- Antarctic clothing and cold weather gear
- first aid
- fire fighting
- basic mountain safety, including roping up, use of crampons, self-arrest, abseiling, prusiking and other crevasse extrication techniques
- emergency shelters, such as snow mounds, trenches and igloos
- radio operation and field communication
- cross-country skiing
- map-reading and other navigational techniques
- familiarisation with field gear, such as motorised toboggans, Nansen sledges, tents, cooking equipment and food supplies.

Previous exploration and research: Mackay, David and Mawson at the South Magnetic Pole, 1909. (Antarctic Division, Australia)

Having the correct footwear and clothing is vital. An expeditioner gets kitted up at the store. (Australian Information Service)

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A geologist peers into a bergschrund, a crevasse formed where a rock outcrop meets the ice of a glacier. A layer of snow can cover the crevasse, hiding it from view. (N. Kemp)

When tractors fall into a crevasse rescuing them can take a lot of time and effort. (Australian Information Service)

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▲ A view of the lee side of Casey Station from the air (L. Goldsworthy. Fund for Animals)

◄ An expeditioner emerges from his tent. Heard Island. 1948 (National Library of Australia)

Activities

1. Discuss in groups of two or three "training for survival in Antarctica".
2. Read through the list of things people should know about before they go to Antarctica. What sort of person would be best suited for a winter in Antarctica? Would you be able to handle Antarctic conditions?
3. Draw up a detailed description (height, weight, age, physical features, occupation, experience, mental ability, general character) of a person you think would be the ideal Antarctic expeditioner.
4. How well do you think women would cope with Antarctic conditions? In the past, have women been to Antarctica? What are some of the reasons for the low rates of participation of women in Antarctic exploration and research?
5. In Antarctica people have to be self-sufficient. Help may not be available. Suppose you are going to work as a scientist or cook. Make a list of any additional skills you think would be useful to you.
6. Find out the meaning of the following words: abseil, prusik, crampon. Of what interest are they to Antarctic expedition members?

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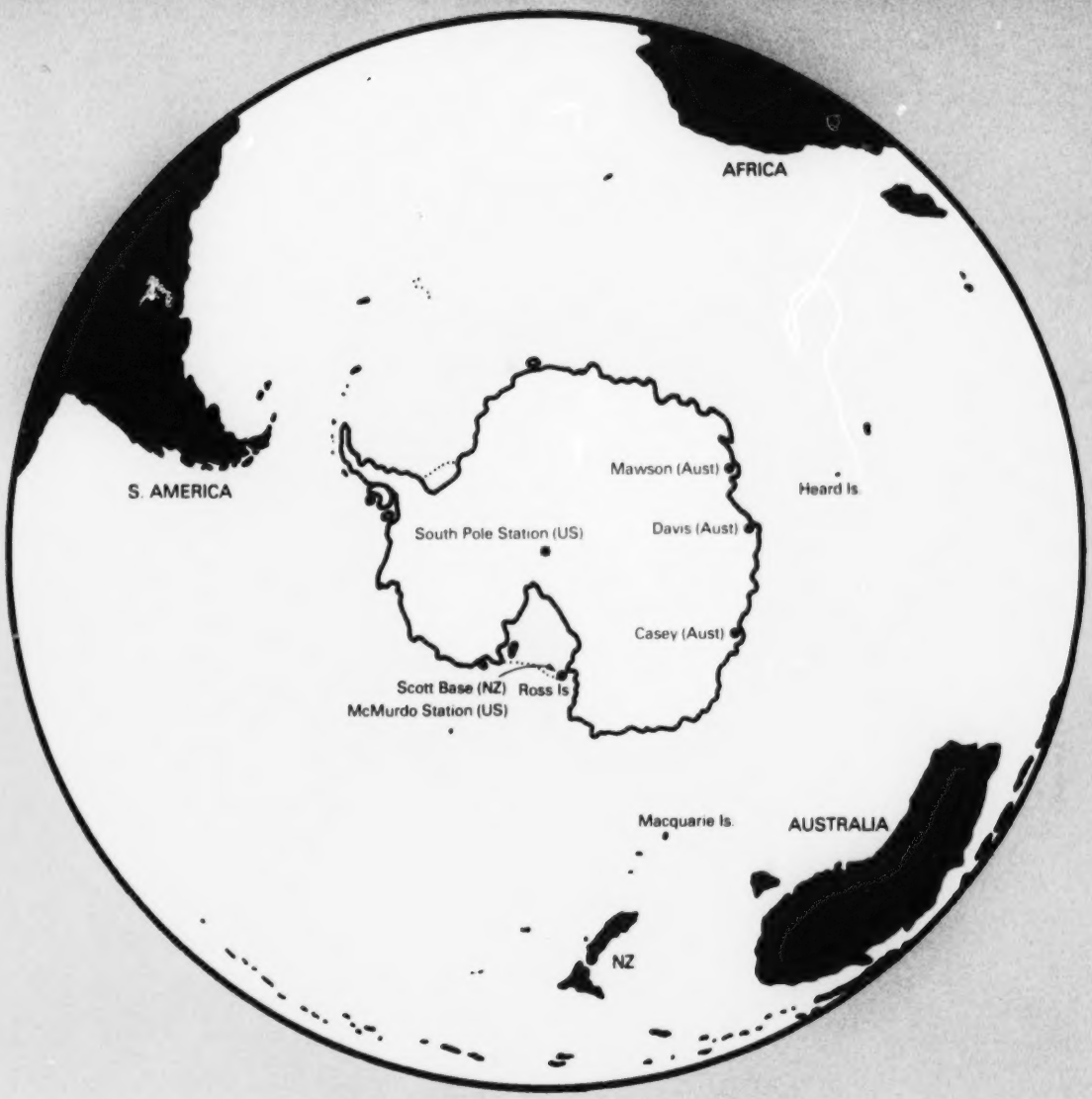
AFRICA
S. AMERICA
Mawson (Aust)
Heard Is.
South Pole Station (US)
Davis (Aust)
Casey (Aust)
Scott Base (NZ)
Ross Is.
McMurdo Station (US)
Macquarie Is.
AUSTRALIA
NZ

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Getting there

The Nella Dan sailing through broken sea ice. (Australian Information Service)

Staff travel to Antarctica either by ship or air. The Australian Antarctic Division charters ice-strengthened vessels, such as the **Nella Dan** from Denmark and the **Icebird** from West Germany. These can pick their way through pack ice, but are not ice-breakers like the US Coast Guard cutters **Glacier** and **Polar Star**. All polar ships can withstand considerable pressure if they are trapped in the ice.

The Australian chartered vessels leave from Hobart or Melbourne, Australia, taking a month or more to do the round trip. Besides taking down the summer crews, they also carry winter provisions for the stations. The ships make several voyages each summer and marine biology and oceanography investigations are carried out during the voyages.

The ships usually carry one or more helicopters. These are used for reconnaissance flights to find the best way through the pack ice. The leads — or breaks in the ice — can be seen easily from the air and the pilots can direct the ship along the most suitable channel.

Most New Zealand and US personnel travel to the continent by air. Early in the season, from late November to early December, Starlifter and Hercules aircraft are used between Christchurch, New Zealand and McMurdo Station, Ross Island. New Zealand personnel then make the short trip from the

A Hercules at the US Base at South Pole Station, Operation Deep Freeze, 1965. (US Navy photo. Quartermain Collection, Canterbury Museum, NZ)

US base at McMurdo Sound to Scott Base. The aircraft do not have to be modified, but can land using their wheels on the smooth ice-runway of the frozen McMurdo Sound.

As summer approaches, the normal two to three metres of ice becomes thinner and weaker and so special ski-equipped Hercules aircraft are used. These land a little further south on a ski-way on the permanently frozen Ross Ice Shelf. Ski-equipped Hercules carry people and provisions from there to other stations.

The Christchurch-McMurdo flight takes three to five hours in a Starlifter and eight to ten hours in a Hercules. The time taken depends on the winds.

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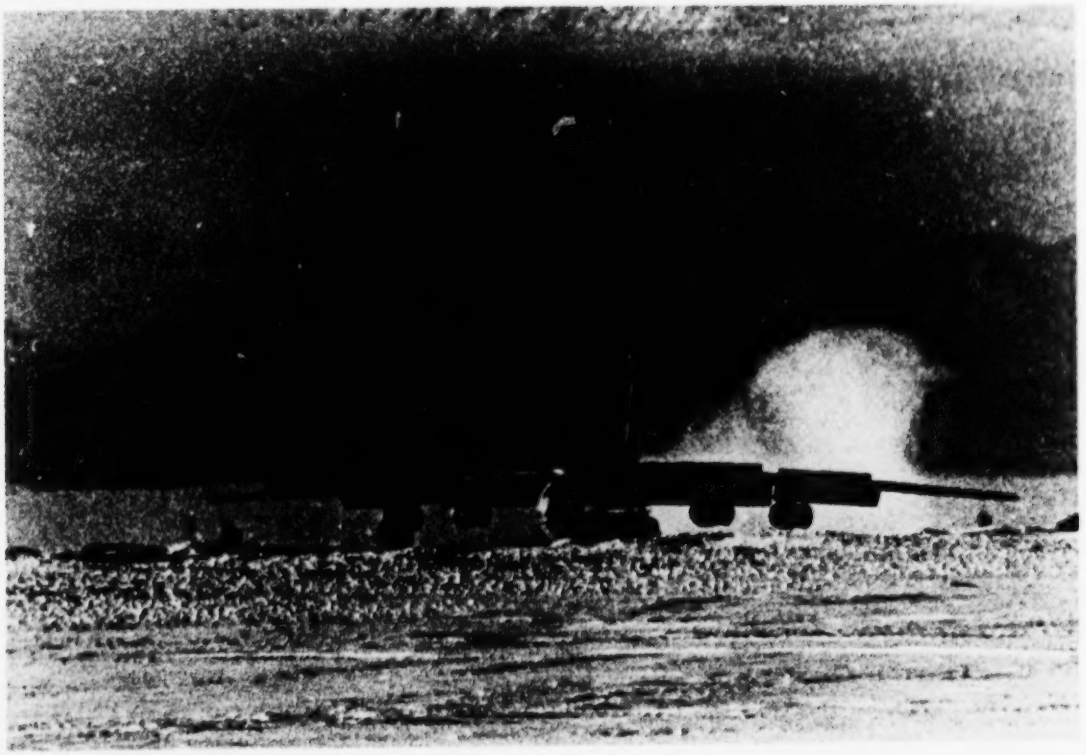
US Coast Guard cutter Glacier breaking ice in the McMurdo Sound. The ship rides up on ice over a metre thick, breaking it. Progress may be only a few metres at a time (N. Kemp)



A Starlifter throws snow and ice as it touches down on the annual ice runway at Williams Field near the big US McMurdo base on Ross Island. (US Navy photo. Quartermain Collection, Canterbury Museum, NZ)

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David Lewis led a private expedition to Antarctica. He describes the journey:

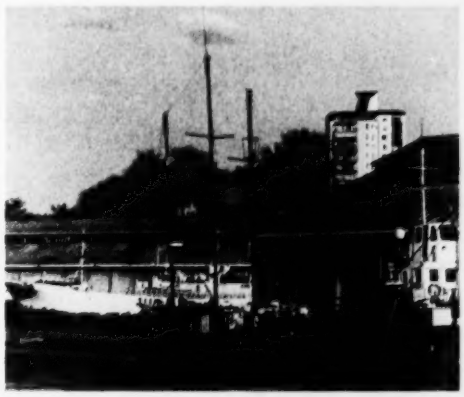
We set sail from Sydney on November 14, 1982, but it wasn't until late January 1983 —some 5,750 nautical miles later, much of it slogging against headwinds — that we entered the polar ice pack. Because of the warnings about dangerous shoals on the west of Prydz Bay, our winter goal, I kept to the east — too far east as it turned out —and sailed in among the clutter of ice almost 200 miles north of Australia's Davis Station, an Antarctic research base. Four days later, having followed meandering open leads between the drifting floes, we were roughly halfway to Davis.

Then, without warning, the half mile-wide leads began to close in round **Explorer**. We barely had time to lay her alongside a concave floe before its fellow bore down on us. The propeller screeched as we were thrust upon submerged ice, and I quickly shut down the engine. We didn't have control now; we were securely locked in, wholly at the mercy of the wind, ice and current. Swept along in the grip of the lumbering floes, we barely managed to slip away into a relatively open pool of water behind it.

By midnight, to the thumping and grinding noises of floes devouring themselves against the berg in a driving gale, we were hard put to remain in the shelter. "Huge floes break up, overturn and sweep past," I recorded in the ship's log. "We have to weave to and fro under power without a break to maintain contact with the sheltering berg."

The pale dawn found the racing clouds slowing down and the gyrations of the pack slackening. By midday the immediate danger was past, and we began zigzagging southward through reopening leads.

from National Geographic, Vol 166, No. 5.

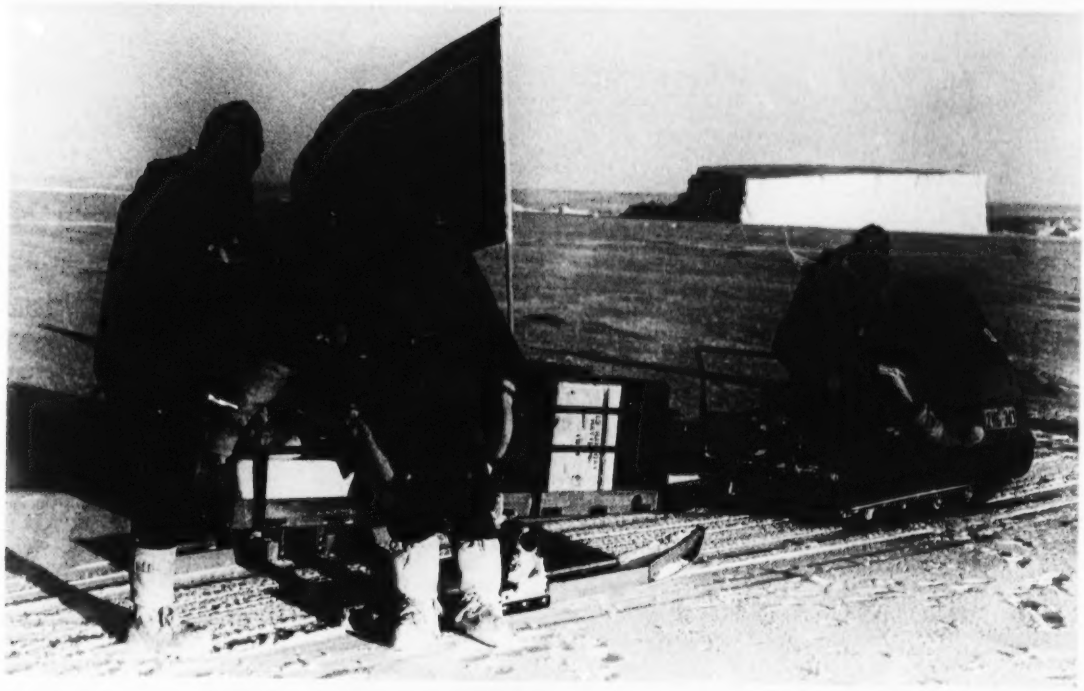


Dick Smith Explorer, a 20 metre steel-hulled schooner

Activities

1. Mapping exercise
   Trace the map on p.20 and mark in:
   - Melbourne, Hobart and Christchurch;
   - McMurdo Sound and Ross Island;
   - the routes between Christchurch and McMurdo Station (for Scott Base) and between Melbourne and Mawson.

   What are the distances for each route? Where are the Antarctic stations of other nations?
2. Find out about some of the famous ships that were used by the early explorers when they went to Antarctica. Some examples are the **Terra Nova**, **Discovery**, **Fram**, **Aurora** and **Endeavour**.
3. What is an icebreaker? Explain how it operates.
4. Modern ships going to Antarctica all have radar and many carry small helicopters. How can these help with navigation?
5. Explain the meaning of the phrase "beset in the ice". Find out about some ships that have been trapped in the ice around Antarctica.
6. Can small yachts reach the Antarctic coast?
7. Make a list of arguments for and against the use of ponies, huskies and motor toboggans for travel in Antarctica.
8. Do commercial aircraft fly over Antarctica? Discuss the economic and safety aspects of the information you have gathered.



A joint Australian-Chinese party on the sea ice. (B. Sorensen)

Antarctic summer clothing. (L. Goldsworthy, Fund for Animals)

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Clothing

An hour or more before reaching McMurdo, the heating in the aircraft cabin is turned off and full Antarctic gear is donned: thermal boots (large rubber boots with an air layer for insulation) or mukluks (rubber-soled, canvas boots with two pairs of quilted liners), thermal underwear, a heavy woollen shirt, woollen pants or wind-proof cotton pants with liners, parka, balaclava, woollen gloves and leather or fur-backed mittens, and sunglasses or ski-goggles.

When living at one of the main stations, normal clothing is worn because the buildings are heated to about +20°C. Parkas, sunglasses, gloves and mittens are worn when travelling between buildings.

When in the field, especially when driving motorised toboggans on long trips, full survival gear is worn. Sleeping bags, usually double- or triple-walled or made of exceptionally good quality goose-down, allow the occupant to sleep comfortably at temperatures down to -40°C or below.

When living in tents, getting dressed in the mornings is guaranteed to wake you up.

A glaciologist with an ice core. It will be transported to Australia for further study. (Australian Information Service)

Blue skies and ice crystals

Off at 8.15. It's a beautiful day with the sun shining out of an absolutely cloudless deep blue sky. With the temperature at -16°C, I'm glad there's no wind.

All members of the party spend a bit longer than usual adjusting their gloves, mittens, goggles or sunglasses, balaclavas and the face flaps of their parkas. The windchill factor will be greater than normal as we whizz along the new track.

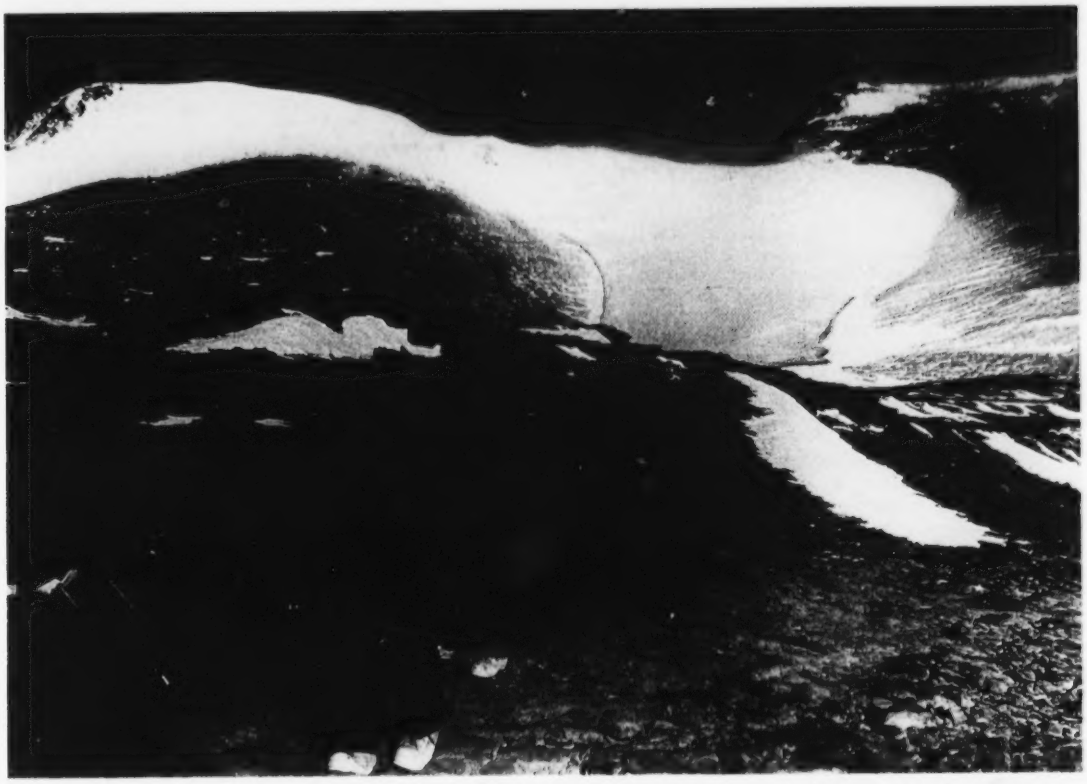
As we move along, the sunlight reflects and refracts off the crystals growing on the glacial surface. They must have sprung up yesterday from the low cloud that prevented us working. It was like freezing fog. It dazzles the eye with all the colours of the rainbow. This beats sitting in an office all day!

Activities

1. List and describe the articles of clothing worn by people working around a base camp in Antarctica.

   Your list should include items for:
   - the head and face;
   - hands and feet;
   - protection against ultra-violet radiation.

2. When workers are out on an expedition from the base camp **full survival gear** is worn. See what you can find out about this.



Intolerable working conditions at the edge of the Polar Plateau. With a windchill factor of -45°C, these geologists had to abandon their work on fossils after two hours. They did the equivalent of 15 minutes of effective work in that time. (N. Kemp)

Leaning into the wind. This picture was taken by one of the best photographers of Antarctica, the Australian Frank Hurley, when he was with Shackleton in 1914-17. (National Library of Australia — photo F. Hurley)

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Physical conditions

In the field

When the weather in Antarctica is good, it is a joy to be in. The skies are a beautiful blue — the azure blue you can see only from high mountains in other places — for twenty-four hours a day in summer. The brilliant white snowfields stretch to the horizon, sparkling like chips of opal as the rays of the sun split into all the colours of the rainbow. The wind-swept ice is a pale blue expanse and the outcrops of rock are subtle variations of brown, orange and red.

And the silence. Nowhere else can you experience such a feeling of solitude. Away from the base camps and stations, you wonder if there can be anyone else in the world.

The sun beats down on you, there is not a breath of air. The temperature is well below freezing, but with a little climbing, rock-bashing and scrambling up scree-slopes you are soon sweating and stripped down to shirt-sleeves. You can clamber anywhere, turn over rocks, sit down without fear of spiders and scorpions. You drink from your water bottle before it ices up, have a mouthful of chocolate for lunch.

Suddenly you notice a chill as the wind picks up. On with your pullover, on with your parka, on with your top layer of mittens. Spindrift snow moves past you from a snow patch a little higher up on the slope.

Hastily you pick up the rest of your belongings and, with your companions, move down to the motor toboggans. The sun becomes dim as low cloud appears right across the sky. The wind speed is increasing and hisses through your hair. You pull up your parka hood and put on your sunglasses as you move on to the snow slopes. Even in whiteouts the reflected ultra-violet rays can still cause very painful snowblindness.

Your companion lets out a surprised yell and you turn to see him with one leg buried to the top of his thigh. "How can that be, just twenty metres out from that rock outcrop?" you wonder. He has dropped into a bergschrund, a crevasse at the snow-covered junction of the glacier and the nearly vertical rock outcrop. With the sun now hidden by cloud, the ups and downs of the surface snow are virtually invisible. In bright sunshine, the slightly sunken snow bridging the crevasse might have shown up.

As your companion carefully works his leg free, you move on again, probing in front with ice-axes and realising that the survival school instructions about always "roping up" when travelling over an unknown surface should be obeyed.

At last you reach the motor toboggans. On with the large fur-backed mittens, as it gets

Two motorised sled parties on the sea ice (Antarctic Division, Australia — photo K. Irving)

very cold just sitting, driving the toboggans. The wind is so strong now that you have to lean into it. It is probably blowing at about forty knots (twenty metres a second). When the speed of the wind increases, it makes you feel colder. This is known as the windchill factor. But after the wind reaches a speed of 40 knots, it doesn't feel any colder.

The moisture freezes on the hairs in your nose, making them feel like pieces of wire. The windchill factor must be at least -22°C. Slowly you realise there is a dull ache across your cheekbones — make that -28°C at least. On with your snowgoggles — at least that will protect a little more of your face.

When the parka hood is properly adjusted, a "tunnel" about fifteen centimetres long is formed in front of your face. This limits your vision, but it does trap some air and so warms your face. Visibility has dropped considerably, but as you move off down the glacier on the toboggans, one or two of the marker flags flying on bamboo poles every fifty metres or so can be seen ahead. If conditions were to get worse, a stop could be made in a Scott tent pitched for such emergencies just ahead. The tent contains three or four days' food as well as sleeping bags, stove and fuel.

Without the flags ahead, your whole world becomes featureless in a whiteout. We did experience a whiteout a few days earlier, but the conditions were quite different. The sun had been shining, there was no wind, it was difficult to tell up from down from sideways. Looking through the camera and then turning around suddenly made you feel sick.

A whiteout

We stopped up the McGregor Glacier, as far as where we turn right up the LaPrade Valley. Dismally, we surveyed the cloud down to within about 100 metres of the ground-snow level. The cloud could rapidly drop lower while we were climbing the scree-slope, making it impossible to see on our way back to the ski-doos, so we turned around and returned to the hut.

Getting well towards complete whiteout conditions by the time we got back. Glad we had the flag-line to follow. It's amazing how that one little bamboo pole and flag can be seen ahead in the gloom.

The wind eases a little and eventually the half-round shape of the hut can be seen faintly through the drifting snow. The toboggan's tanks are carefully topped up — a half-full tank can create problems in starting the engine next time, as water condenses in the tank when the machine cools.

Someone had remembered that morning to bring food into the hut for the evening meal and leave it on the heater to thaw. The twenty litre container, also on the heater, had been topped up with snow earlier and now contains water. If we had been out in tents, ice or snow would have been collected and melted, and tinned or frozen food thawed over the stove.

The basic activities of living in the field are very time-consuming and have changed little since the heroic period. Washing of bodies, clothes and dishes is, by necessity, kept to a minimum. In a tent, the air warms up, often to an uncomfortable level for those wearing outside clothing.

My kingdom for a bath

At last, at last, my turn for a sluice (can't really call it a bath or shower). Making water is slow and the container holds only twenty litres. It's used for everything — cooking, drinking, washing and so each person can have a sluice every sixth day. I heat up a little more water on the white spirit stove (the water is only lukewarm in the snow-melter), bring in the big hip bath and proceed to pour water over myself.

Once wet, you soap up, lather yourself all over. It's amazing where all the dirt comes from. With a final rinse, you only use four litres for the whole operation.

A brisk rub down with the towel and I feel a new man. I wonder how long it will be before I'm taking a shower for granted once more?

Not much activity tonight. "Lights out", which means taping bits of cardboard over the windows to block out the sun, is around 10 o'clock tonight.

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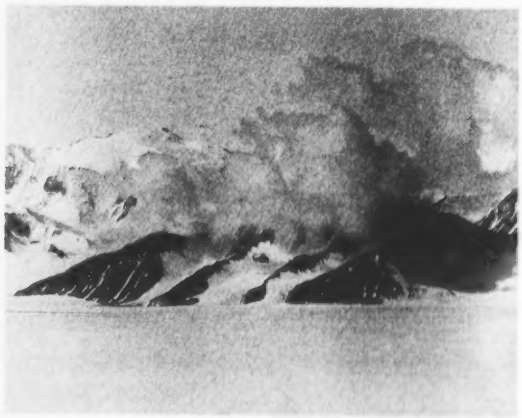
A New Zealand party's field camp, with Commonwealth Glacier in the background. (Antarctic Division, NZ)

◄ An ice mask. Moisture from the breath is frozen around the inside of the hood of an explorer of the Heroic Age, seventy years ago. (National Library of Australia — photo F. Hurley)



The Lanterman Range rapidly clouds up, as a helicopter crosses the Rennick Glacier on its way back to base camp. (N. Kemp)

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Cooking out in the open is very wasteful of fuel, as much heat is lost to the air. It is just about impossible to eat out in the open. The food cools down too quickly. A cup of boiling water can start to freeze in ten minutes. In some ways, dehydrated food is easier to prepare, as it does not have to be thawed — it does, however, require water. Tinned and frozen food takes a long time to thaw.

Minor difficulties become more important after some time in the field. Toothpaste is very hard to squeeze out of a tube when it is frozen; scratches and cuts take longer to heal, especially on the extremities, such as the hands. With the continual cold — even with mittens and gloves — the blood vessels are constricted and the diminished blood supply prevents normal rates of healing. A constant drip from the nose, caused mainly by the condensation of water vapour from exhaled breath, often leads to an open sore just under the nose. Chapped lips and a sunburnt face are constant worries, but can be prevented with creams and oils. When people are in the field, "calls of nature" can often be very uncomfortable and even dangerous, especially during long blizzards.

Inside a Scott tent — melting snow for drinking water (B. Sorensen)

The dry cold

When you are working in the cold, your nose runs. If you are wearing a balaclava, which helps to reduce the likelihood of frostbite on the face, you breathe into it and your breath freezes in it. If you are working hard (especially running with the dogs), you finally get a block of snotty ice frozen on to your beard and sometimes a great icicle hanging down. This makes eating awkward, so that on the run, you might be poking strips of chocolate down the breathing hole that's formed.

You get very thirsty because you're breathing in dry air and huffing out moist air. You can only suck on a bit of snow (the warnings about this are mostly nonsense; it's OK if you do it steadily), so you dehydrate. People lose amazing amounts of weight on dog runs and then put it back on again in a few days. It's not so much fat as water, which is replenished at the journey's end.

On the subject of moist breath in cold air, an interesting thing happened to me. I led a traverse to set up a base camp in Enderby Land. We had to mark out the route and then, before satellite navigation had been well developed, we used sunshots to fix positions. Navigators in ships can use a sextant, which depends on a level horizon. The ice cap isn't level and the horizon can dance (mirage) or be obscured. So we use theodolites.

I was busy making an observation one day, holding my breath as I fiddled with metal knobs at about -30°C (wearing silk gloves, bloody cold things). I couldn't hold my breath any longer and gently exhaled. The freezing of my breath attached my eyelashes to the eyepiece and I had to pull the eyepiece out, go to the living van and thaw out over the stove. Picture it.

The effects of two physical phenomena dominate everyday life — the latent heat of melting and freezing and the effect of air pressure on temperature at boiling point. Can you imagine how long you have to wait for a cup of hot soup after a day running with the dogs, when you first have to melt the snow? And then snow seems to be about 99.9 per cent air. I guess you can. But inland at, say, 2000 metres altitude, boiled water isn't quite as hot as at sea level.

David Luders

Surrounded by clothing drying in the upper, warmer parts of a 'Jamesway' hut, the author relaxes in his goose-down filled sleeping bag during bad weather. (N. Kemp)

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Mawson Station, showing workshops and fuel tanks
(B. Sorensen)

Horseshoe Harbour, Mawson. (Antarctic Division, Australia —
photo I. Marchant)

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At a station

An Antarctic station in many ways resembles a small town or village. These small communities, however, rely almost entirely on outside support. All supplies, from toilet paper to the most advanced scientific equipment, must be delivered each summer and last the whole year.

Some activities require staff to be on duty round the clock. Meteorologists and communication officers work shifts so that one or two people are on duty at all times, including Saturdays and Sundays.

Of course everyone hopes that the medical officer does not have much to do. There are often minor injuries and ailments to attend to and the medical officer may carry out some dental work. The medical officer is also responsible for the general health of the station, including checking the quality of food and making sure the equipment and drug supplies are adequate to take care of any medical emergency.

Electricity is provided by the diesel electric generators and it is very important to have a continuous supply of electricity through the winter months. The station buildings are heated by a combination of hot water from the cooling system of the engines, and electric heat. The inside temperature is kept fairly constant, both for comfort and because of the sophisticated scientific equipment there, including computers.

As the wintering party spends such a long time in a small, isolated community, it is important that each member is tolerant and understanding towards others. It requires co-operation to keep the whole station running smoothly, and one of the main tasks of the officer-in-charge is to try to sort out any problems before they become a source of friction or discontent.

Working conditions at the stations are kept as similar as possible to those at home. Even so, by the end of the year, the members of the wintering party are looking forward to getting home to their family and friends, and seeing a warm beach and gum trees. Most will look back with nostalgia and a feeling of satisfaction when they think of their time in Antarctica.

Landing jetty at Casey, with mobile crane. Barges transport cargo from ship to shore. (L. Goldsworthy, Fund for Animals)

Early in summer, ships may unload straight onto the sea ice. Tractor trains then take the cargo to the station (Antarctic Division, Australia — photo C. Scotti)

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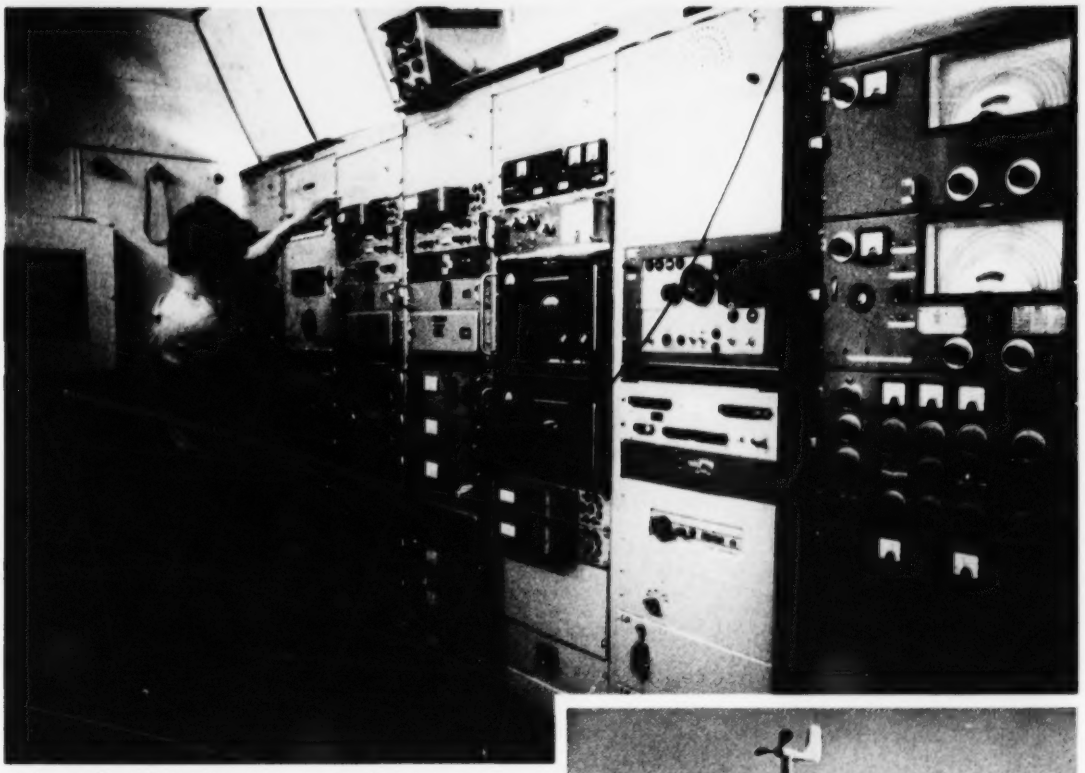

Modern radio and scientific equipment needs constant care. (Antarctic Division, Australia — photo M. Price)

Working on a mast bearing wind-recording instruments. ► (Antarctic Division, Australia — photo P. Arriens)

Activities

1. Draw a graph that enables you to compare (for summer and winter):
   - the average temperature at the Antarctic coastal stations;
   - the average temperature on the Antarctic plateau;
   - the average temperature in your classroom.
2. Which medical problems are most likely to occur in Antarctica?
3. Make a list of the possible methods of heating living and working areas at an Antarctic station. What would you do to minimise heat loss?
4. At home, measure out four litres of water and use it to wash and rinse yourself. What does this experience tell you about what it would be like to live in Antarctica?

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Monthly climatic summary for Australian Antarctic stations

Station	June 1982			
	Mawson	Davis	Casey	Macquarie Island
Mean temperature (°C)	-23.2	-22.2	-15.0	+4.3
Maximum temperature (°C)	-7.9	-10.5	-1.2	+7.9
Minimum temperature (°C)	-34.0	-38.1	-28.4	-1.2
Mean wind speed (knots)	12.0	7.0	11.7	15.9
Maximum wind gust (knots)	66(SE)	42(NE)	98(E)	56(W)
Days strong wind (>22 knots)	21	4	15	23
Days gale wind (>32 knots)	7	0	10	4
Days rain/snow	3	9	12	20
Mean daily sunshine hours	0.1	0.0	N/A	0.5

Station	January 1983			
	Mawson	Davis	Casey	Macquarie Island
Mean temperature (°C)	+0.9	+1.8	+1.9	+6.4
Maximum temperature (°C)	+6.2	+7.8	+6.0	+10.5
Minimum temperature (°C)	-5.1	-2.9	-6.1	-2.4
Mean wind speeds (knots)	20	9.3	9.8	11.3
Maximum wind gust (knots)	79(SE)	53(NE)	57(E)	52(W)
Days strong wind (22 knots)	25	5	10	14
Days gale wind (34 knots)	8	0	6	2
Days rain/snow	9	4	12	26
Mean daily sunshine hours	5.5	9.3	N/A	2.2

Adapted from **ANARE News**

5a) In winter, which station had the lowest mean temperature? Which had the highest mean temperature?

b) When and at what station was the lowest temperature recorded?

c) In summer, which station had the highest mean temperature?

6a) Which station had the highest mean windspeed in winter? In summer?

b) Which station had the most windy days (strong and gale winds)? Which had the least? Which is the windiest station?

c) In summer, which station had the most sunshine?

7. From this information, deduce which station has the most favourable climate — Mawson, Davis or Casey.

Which station has the most wet weather?

8. Study carefully all the climatic data on Macquarie Island. Describe as fully as possible what the climate of this island must be like. Would you like to go there for a holiday?

9. Would you expect to find any materials suitable for use in construction in Antarctica?

10. Fire is an ever-present hazard in Antarctica. Why is it so difficult to fight fires in Antarctica?

11. The buildings at Casey station are on stilts above the ground. Can you suggest any reason for this?

12. Where huts at a station are separated, there are usually ropes linking them. When are the ropes useful?

Leisure at a large field camp: volleyball in near white-out conditions. (N. Kemp)

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Leisure time

In Antarctica, work doesn't stop just because it's Saturday or Sunday. It is extremely expensive to send people there, so when the weather is good and other condtions are right, there is no leisure time apart from eating and sleeping.

Because the weather is so changeable, you usually work when it is fine. If it remains fine for one or two weeks, the work continues. When the weather breaks, it may not be possible to work outside for one day — or ten. Rest time is made up then.

On private expeditions, the participants keep busy too. David Lewis comments:
In fact there was much to keep us occupied. It was necessary to trench along one side of the hull of the boat daily to keep the fast-forming ice from pushing it over, and every third day we would clear the exhaust port so we could rev up the ship's engine. Jannick had his fish traps and fishing holes to monitor. Gill was going from strength to strength, throwing herself into every aspect of the expedition. And we all had nearby bird cliffs and the emptying Adelie penguin rookeries to study and visit.

from National Geographic, Vol 166, No. 5.

Leisure activities for people at the permanent stations vary according to the facilities available, but they include:

- films
- photography
- volleyball (in a whiteout, the white ball can be lost from play!)
- cross-country skiing (usually restricted to a flag-line for safety)
- jogging (although this can be difficult in soft snow)
- sunbathing (well out of the wind)
- indoor games, board games and cards
- lifting weights and other exercises
- playing musical instruments
- painting
- writing (diaries, letters, poems, songs, stories)
- "ham" radio communication
- and, of course, reading and talking.

The silence

I cut large snow blocks from the hard-packed snow on the surface of the glacier. The purpose was to pack them around the generator to keep the noise down. Jim is a "ham" radio man and he runs it for four hours or more a night. It becomes a bit wearing, especially in the otherwise absolute silence of Antarctica — well, it is silent out here on the glacier when there is no wind blowing.

Luckily reception tonight was not too good and so he knocked off at about 8 o'clock tonight. The silence was deafening!

There are probably more books read per head of population in Antarctica than on any other continent. Sitting around and exchanging experiences, telling yarns and anecdotes, philosophising, reminiscing and "talking shop" fill most of the leisure time available, especially early in the season.

An evening on the ice

Ham again, macaroni, corn and diced pineapple, lots to drink. I never seem to be able to drink enough to satisfy my thirst before my tummy is too full to take any more.

People were reading and writing after tea tonight until about 10pm. I gave up writing at 11pm as the pen would not work properly. The heater doesn't work too well when the temp. gets too low outside. It's -20°C now so I might even zip up my sleeping bag tonight. Shades up soon after 11.

When in the Antarctic, some people become inspired to do things they would never think of doing back home. On the other hand, a few seem to be content to sit around and wait until they leave. Generally, people keep themselves fully occupied, mentally and physically, outside working hours.

Sailboarding on the ice near Mawson (Antarctic Division, Australia — photo G. Cooper)

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Cold feet, hot head

Felt very homesick all day. Not even half-way yet. I wonder if I'll make it. Suppose I'll have to. I lay down after tea and dropped straight off to sleep for an hour. I wonder if my tiredness added to the nostalgia? Spent an hour or more labelling, numbering and wrapping up specimens collected today. Everyone was asleep by 10 o'clock. I sat up, writing home.

I worked out earlier tonight why I got cold feet when I was sitting on my bed writing, with my feet on the floor. The temperature at floor level is -3°C, bed level 8°C, chest level 18°C (while standing), head level 31°C and up near the ceiling, it's 38°C or 39°C, even though the window is always open. Those temperatures, apart from the floor level reading, are all plus. So, although it's hot high up in the tent, the air is amazingly stratified. It must be the dense, cold air outside preventing the lighter, warmer air in the tent from escaping or circulating.

Having taken these readings, I went outside for a large piece of five-ply from a packing case and gouged some depressions in it for the legs of the chair to sit in. Now, while sitting in the chair writing, with the chair placed on the fiveply on the bed, the biro is at about 18°C and so flows more freely and my feet don't become numb as they're at bed level, at 8°C or 10°C.

Stuck up the shades around midnight.

Activities

1. Study the photograph of a Jamesway hut on p.31. Draw a cross-section of the hut, including a bed and a figure of a person. Rule across lines at bed level, chest level and head level, marking in the temperatures indicated in "Cold Feet, Hot Head".

   What is the range of temperature from floor level to roof level?

   How does this range compare with the daily range of temperature found in Australia or New Zealand?

   Explain why this stratification of air occurs.

   What steps might be taken to even up the temperatures in the room?

2. Make a list of the things you would take with you for use during recreational periods if you were going to winter in Antarctica.

3. It is the chef's day off duty. You are responsible for the evening meal. Which dishes would you prepare, bearing in mind that they should be appetising and that fresh fruit and vegetables are not available?

4. Antarctic explorers and expedition members often keep detailed diaries. Why do they do this? Would it be useful to keep a diary?

Among the pressure ridges near Ross Island. The northward-moving ice of the Ross Ice-Shelf strikes the rocky mass of Ross Island and buckles up. (N. Kemp)

Ready to cope with the Antarctic weather. (B. Sorensen)

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A typical day from a geologist's diary

Sunday, November 27
0/8 cloud cover, -13°C at 7.30am. One-knot easterly wind. Woken up by generator as Jim made wireless contact with McMurdo. "No traffic" i.e. Jim just reported that all was well, "over and out".

Canadian bacon (cooked, tinned bacon — quite nice) and very rubbery scrambled egg made from powdered egg; frozen orange juice.

The heater was turned down too low last night which meant that it was cold this morning when we woke up in the hut. The water in Ken's cup had frozen overnight.

I washed up, Jim dried. Our roster is getting under way, so that each meal, one pair washes and wipes up and one pair cooks. It means you are on "duty" every other meal.

Grabbed a big handful of peanuts for lunch and then as we went out to the ski-doos (motorised toboggans), everyone got a 150 gram block of chocolate for lunch.

Off about 10am collecting more bamboo poles and trail flags from the stockpile for the unflagged portion of the McGregor Glacier and then up into the LaPrade Valley, where we didn't finish probing crevasses yesterday. It was decided to take the fourth ski-doo, as one of them yesterday had three people in it and it was a bit unstable on the steeper, icy parts where we were travelling. I scored the one with no starter — that is, the electric starter doesn't work and I have to pull-start it.

On as far as the Scott tent which we've left halfway between the hut and our final destination up in the Cumulus Hills. We've left supplies for emergency use if we get stuck up in the hills, caught in a whiteout or the like, and can't get back to the hut. There is a sleeping bag, wireless and generator, stove and fuel and a fair bit of food. Untied the Nansen sledge as the going was too hard pulling it up the valley any further. Sorted out our gear, loaded ice-axes, geological hammers and so on, in our packs or on the ski-doos and headed up the valley.

From the Scott tent there seemed to be a dolerite sill "damming" the valley, but getting up there we discovered that there was ice only on the flanks of the valley. Bill took his ski-doo over there, got on to the ice — and promptly slipped sideways until the tracks came to a snow patch. We decided to give that away.

I went back down a bit and found a place, only five metres across, where rocks bridged two patches of snow. Using ice-axes, picks and our hands and feet, we brought snow over to cover the rocks until, forty minutes later, we had a snow path joining the snow patches and so were able to get on to the ski-doos and off we went up the valley, getting a bit steep, valley decreasing in width.

Suddenly we reached the head of the valley and the snow went up pretty steeply. I kept the throttle open and the vehicle kept going until we reached the top of the snowfield. Wow! The brakes wouldn't hold! I turned right so that I was at right angles to the slope. The ski-doo was then nearly rolling over. I hopped off and pulled the front around so it was 45° towards downhill. The others arrived and parked in the same way. Ken pulled out his Brunton to measure the slope. It was 22°. That's an incline of about 40 per cent — about the maximum a Landrover can do, I think.

With haversacks on and picks out, we went on up the hill, over real moraine, mostly heavily stained dolerite boulders. Only about 250 metres to climb today, up to the Fremouw Formation; buff-coloured sandstones, siltstones and mudstones, hopefully fossiliferous. It was not far from here that Jim, seven years earlier, had climbed out of a helicopter and found the first vertebrate fossil from the Cumulus Hills.

I went with Jim, Ken and Chuck so that one of our team will know the stratigraphy when the others leave. Cos, Bill and Wick looked for fossils for about three hours but found none.

By four o'clock we had made our way west overlooking a wide snowfield which continued on to Half Moon Bluff. We spent about half an hour with a map trying to sort out the peaks, but couldn't. Temperature now -18°C, but there is no wind. This means it is tolerable, except when handling the cameras with bare hands.

Started back down, on to the ski-doos —without passengers until we get on to the more level terrain — and went down with the brakes on. Waited near the bottom for the passengers and moved off across the snowfield, across the "path" we had constructed, and stopped at the Scott tent. We tied on the Nansen sledges, the passengers hopped off ski-doos and sat on the sledges as it is a more comfortable ride.

Back at the hut, Bill and I topped up the fuel tanks of the ski-doos; they take a 5:1

petrol-oil mix as they are two strokes.

Tough, half-cooked steak and dehydrated spuds and freeze-dried beans for tea. Started washing five pairs of socks (boy, did they need it as my feet sweat so much). I put them into the water softener and then into the special wool detergent, but I put in too much as I discovered as bubbles flew everywhere. I spent the next two and a half hours melting snow to make enough water to rinse the darned things out. I'd forgotten that water from snow-ice is about as soft as you can get. I'll have to modify my washing procedure in future.

When I finished, Ken and I melted more snow on the stove and made a gallon of jelly, five pints of which is already gone — they didn't even give it a chance to set. I suppose all the exertion today on the slopes in such dry conditions really dehydrated us. I notice when Cos gives the weather reports to McMurdo, the relative humidity is about 15 per cent —that's pretty dry.

A morning "chore" that is developing already is applying my "make-up". The junction between my nose and lip is sore and weepy, probably from being continually wet from my constantly dripping nose. This is because the air breathed out is 100 per cent saturated and so the moisture condenses on coming out into the dry, cold world. I have started putting an oil-based ointment on it. Also in the mornings I apply heaps of zinc cream. It certainly stops you getting sunburnt all day. The only trouble is I have yet to work out how to get the darned stuff off at night. Seems to be no substitute for scraping and wiping it off. You can still get sunburnt at midnight if you are outside. I am using barrier cream on my hands. I didn't at first but found that I was developing cracks and sores which won't heal. I suppose our cold hands and the resulting restricted blood supply would explain that. The cream does seem to help prevent the skin from cracking so much.

It's 10.45 and everyone is in bed and quiet. I'll just top up the big pot on the stove with snow so we'll have a good supply of water in the morning and be off to bed too. Most un-Sunday Sunday I've ever experienced!

Skidoo and sled travelling over the sea ice. (B. Sorensen)

Braving the elements during a blizzard at Cape Evans, Ross Island. (N. Kemp)

Activities

1. You are a zoologist in Antarctica, investigating how emperor penguins spend the winter. There is a major emperor penguin colony some fifty kilometres from your base camp, which is at the edge of the ice shelf. Your job is to get to the colony and observe and count the penguins. There is a trail to the colony, well marked with bamboo poles.

   Write a brief diary account of your expedition, mentioning in particular the transport arrangements.

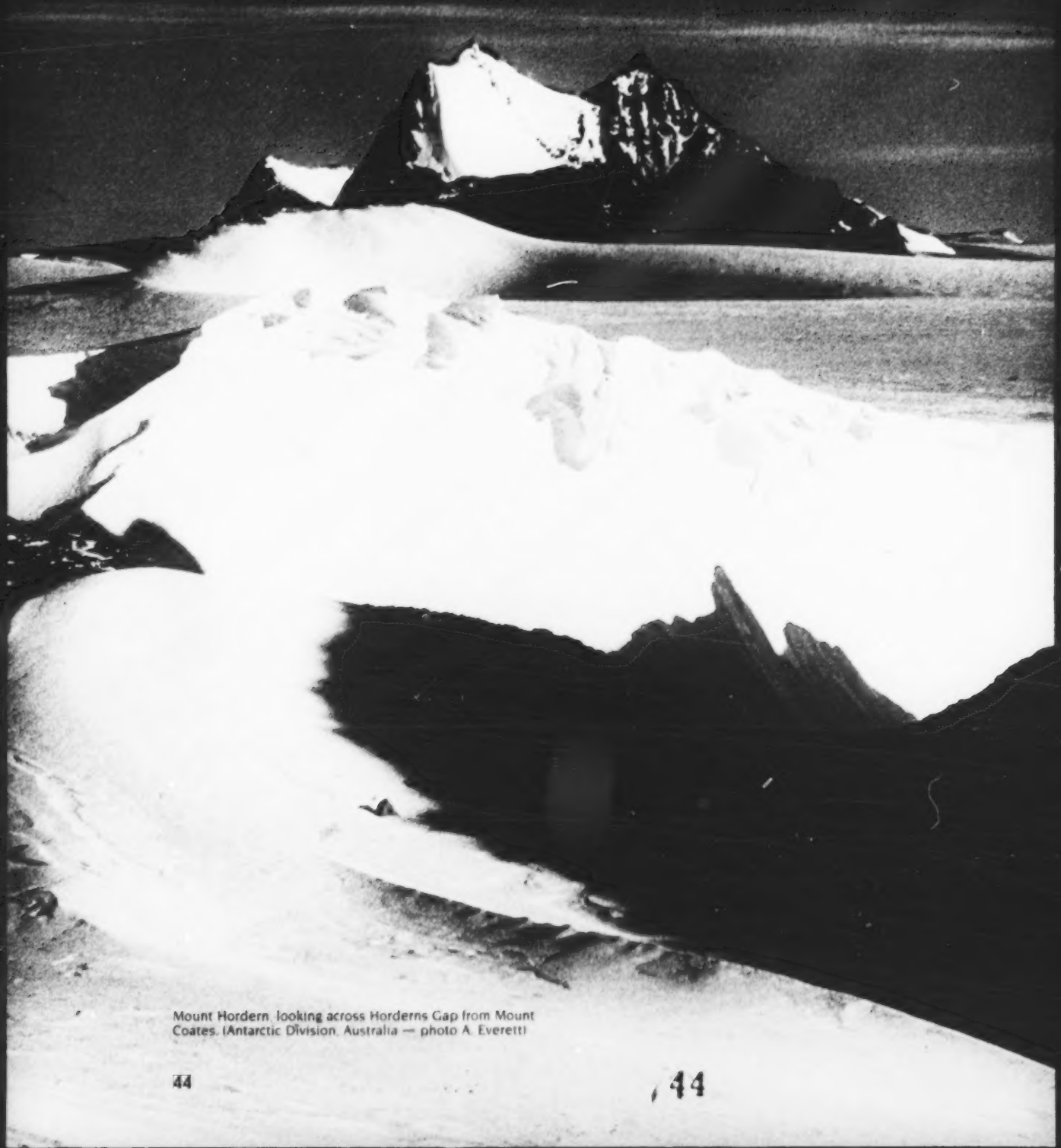
   You may wish to illustrate your story account with a map of your journey and sketches of any exciting incidents.

2. Early explorers such as Scott perished in Antarctica partly because they severely underestimated the amount of food they needed to survive.

   Find all the references to food in this book, and categorise them under the headings below.

   What foods are mentioned most — proteins, fats or carbohydrates? Why is there a need for high energy foods in Antarctica?

FOOD ITEM	PROTEIN (muscle building)	FAT (energy)	CARBO-HYDRATE (energy)	VITAMINS & MINERALS
milk	medium	medium	medium	high
chocolate	low	high	high	low
peanuts				



Mount Hordern, looking across Horderns Gap from Mount Coates. (Antarctic Division, Australia — photo A. Everett)

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Looking back

David Luders spent two winters in Antarctica, one at Casey and one at Mawson. Here are some of his comments as he looks back.

How people react

The environment there is overwhelming and after a while people react differently. Some flee, some are exhilarated, some are stolid and so on. But it affects everyone. The place, I mean, not just the social and work environment. It is like an ever-present brooding eminence. I wrote poetry and prose, struggling to capture my feelings. Here are some examples, to illustrate.

from **This Wind**

> Through winter's dark it rules, and in its seasons holds us captive...In lighted rooms we heard it, an ululating animal beyond...We have staggered in its frenzy, defied its force and felt defiance breed strange joy, a perverse exhilaration...It has torn our plans and strewn our small endeavours...There is eternity in this wind, and men can feel it. In a place reduced to elemental perfections, it dominates.

from **Glimpses**

> Stillness fills me in this clear perfection. In wonderment I scarcely breathe, to hear the silence tinkle. It seems the world is crystal light forever.
>
> As we walked, it seemed there was no earth, and knobbled ice shone silent... We were real, the world a ghost had gone to sleep and silently, the moon was washing clean my soul.

The sun gleams off the blue ice of a glacier. Large masses of ice are rarely flat. The man in the foreground and the two tents on the skyline give an idea of the great size of these undulating hills of ice. (N. Kemp)

That is enough to give the effect, on me, anyway. I think most people there are at some time or another starkly presented with themselves, and they may rise to the experience or "run away".

What happens is that the normal social existence, where you can escape from unacceptable personalities, is denied. We all need variety in human contact to keep perspective. Seeing the same faces, day after day, becomes a burden. You know the others' reactions so well that after a time you know almost exactly what to expect — except in a crisis. When a field party goes out, it changes the pattern and that is a kind of relief because it changes the emotional reactions of the group left behind. When they come back, it is a welcome event. A kind of variety is reimposed, though it is transitory.

A colony of Emperor penguins on the sea ice. (Antarctic Division, Australia — photo M. Cutcliffe)

This probably sounds frightful, but it's not. There is for most a sense of belonging, despite the inevitable irritations. That sounds like a family and, in a sense, it is. But through it all is each person's aloneness, and there is time to think. You don't touch money, everything is provided. But there are clear obligations. Many of the things that dominate normal life don't exist and you have time to think. Self-control is one of the things that becomes a respected and valued trait and it takes effort, especially for those whose earlier training was weak. Another of the things is individual enterprise. Some people show surprising resource and find real self-confidence.

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Activity
Model of Geodesic Dome

The original buildings at the South Pole station were erected in 1955-57. It was necessary to replace them by the mid-1970s because they were covered with ice and snow. The new buildings included an aluminium geodesic dome 17 metres high and 50 metres in diameter.

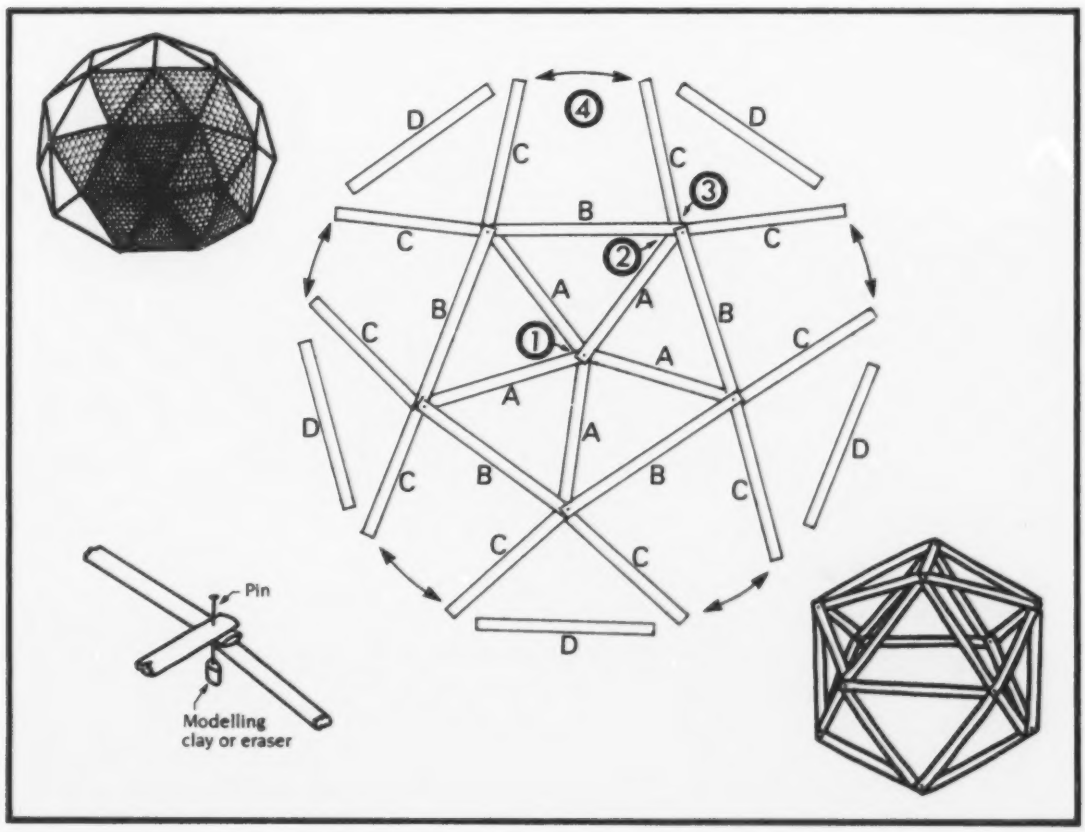
The dome has four advantages. It has great strength, resists wind and does not collapse under snow. It requires less material than other buildings, and is therefore easier to transport and less likely to sink into the ice. Finally, it can be built quickly and encloses a maximum of space for a given surface area.

A geodesic dome can be built simply with plastic straws and pins. You will need 25 straws and 11 pins. You should cover the ends of the pins when you are finished making the dome. Use pieces of an old eraser or modelling clay.

It is best to mark the straws. Wrap a small piece of masking tape around each one and mark them with a pencil or use coloured tape. Mark five straws with the letter A, five with B, ten with C and five with D. (Alternatively, you may be able to get straws with four different colours or mark them with coloured tape.)

1. Join the five A straws all at one end. This is the vertex or top of the dome.
2. Form a **pentagon** by joining the B straws to the loose ends of the A straws. Gently bend the apex into a point. Wrap it with a piece of tape for strength if necessary.
3. Join two C straws to each of the five corners of the pentagon.
4. Make the base of the dome by joining a D straw to each place where two C straws come together. To do this, you will have to pull the dome gently into shape as you go.

REMEMBER: Put something over the ends of the pins.



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GLOSSARY

abseil	Lowering onself with a double rope down a rock face.
amphibious craft	A vehicle that can operate on either land or water.
aurora	Moving streams of light above the atmosphere, visible at high latitudes.
balaclava	Woollen helmet for the head and neck.
bergschrund	The crevasse that separates the moving ice at the head of a glacier from the rock above.
blue ice	When wind removes the loose snow, solid ice, some kilometres deep, remains. Its colour appears blue.
Brunton compass	An instrument usually used to measure the slope and direction of rock formations.
crampon	Spiked iron plate worn on shoes to provide a better grip.
crevasse	Crack in the ice formed when the ice moves over uneven rocks or when floating ice spreads.
dolerite	Medium-grained variety of dark, igneous rock.
fossiliferous	Containing fossils.
glacier	Slow-moving ice formed from accumulated snowfalls.
heroic period	The period from about 1900 to 1940 when early Antarctic exploration was carried out.
icefall	An accumulation of ice that has fallen off the rocks above a glacier.
igneous rock	Rock formed from cooled magma.
ionosphere	The layers of the earth's atmosphere beyond the stratosphere.
lead	A navigable passage through the pack ice.
moraine	Irregular mass of boulders, sand and clay, transported on a glacier.
meteorite	A fragment of stone or metal that has reached the earth from outer space.
Nansen sledge	A sledge designed by the Norwegian explorer Nansen.
orientation	Locating oneself in one's environment.
pack ice	Area of loose ice covering the sea.
prusik knot	This knot attaches one rope to another with a hitch that slides easily but jams when under a load. It is useful for climbing up a rope.
reconnaissance	Preliminary examination of a region for its natural features.
refraction	Bending or change in direction of a ray of light.

roping up	Using ropes to link oneself together with other people when moving over crevassed ice or steep slopes.
scree-slope	Mountain slope with small stones that slide down when trodden on.
sedimentary rock	Rock formed by layers of settled, deposited matter.
sextant	Instrument used in navigating and surveying, for measuring the angular distance of objects.
ski-doo	A small, motorised toboggan.
snow-bridge	Layer of ice and snow that covers the opening of a crevasse.
snow-melter	A device used to prepare water for drinking and washing from ice and snow.
snowblindness	Loss of vision caused by reflection of strong light from snow or ice damaging the eyes.
spindrift snow	Fine pieces of snow carried by wind.
stratigraphy	Classification, naming, correlation and interpretation of stratified rocks.
sunspots	Dark patches on the surface of the sun which affect magnetism and other phenomena on earth.
theodolite	A surveying instrument for measuring horizontal and vertical angles.
thermal boots	Double-layered boots with special insulating qualities.
traverse	The path followed by scientists or surveyors, marked by points from which bearings and measurements are taken.
ululate	Howl or wail.
vertebrate	An animal with a backbone.
whiteout	Conditions when thick cloud causes the sun's rays to be reflected from cloud to snow and back, making the observer lose perspective and be unable to distinguish the horizon.
windchill	The reduction in temperature effectively experienced when exposed to the wind.

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Living and Working in Antarctica is one of a series of sourcebooks which are part of the Pacific Circle Consortium's Antarctic Project. There are four storybooks:

The Adventures of Salik the Husky (8-10 years)
The story of a Greenland husky pup's voyage to Antarctica, and how he learns to be a sledge dog.

The Life of Rocky the Rockhopper Penguin (8-10 years)

Oscar (10-12 years)
This true story tells of a husky named Oscar and his fight to remain "king dog" of the sledge team. He spends some time at the Melbourne Zoo and returns to spend his last days in the ice and snow.

Castles of Ice (11-13 years)
A true story of Antarctic adventure, Castles of Ice describes a sledging trip to the Douglas Islands and the difficulties and rewards of working in Antarctica.

Other sourcebooks in the series are

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Background information on Penguins and case studies of three penguins — the Adelie, the emperor and the rockhopper.

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Campbell Island comes under New Zealand administration and is a meteorological base. The animals and plants are described and the effects of human interference are examined.

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A filmstrip with 72 frames and an accompanying script and audio-tape.

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Case studies of three Antarctic birds - the south polar skua, the snow petrel and the Adelie penguin

Learning Outcomes and Activities which can be used with these modules are included in the teachers' guide. **Teaching and Learning about Antarctica**, to be published by the Curriculum Development Centre.

For older readers:

The Polar Continent

Seals of the Southern Ocean

Whales of the Southern Ocean

Antarctic Foodchains

The Scientist at Work

It Happened in Antarctica

From Snow to Icebergs

Ecosystems of the Southern Ocean

International Relations in Antarctica

The Geology and Mineral Resources of Antarctica

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